A Mission Operations Architecture for the 21st Century

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We propose a new operations architecture for low cost missions. We believe this framework will enable NASA to face its major challenges beyond 2000; increasing the rate of scientific exploration missions with a lot less money. Our scheme is composed of three elements:

- ***Service Based Architecture***
- ***Demand Access Automata***
- ***Distributed Science Hubs***

These elements together, will have the combined effect of providing the motivation for increased scientific participation, the justification for infusion of advanced technology, and the incentive for efficient use of limited resources.

The *Service Based Architecture is* predicated on a set of standard multimission services being defined, packaged and formalized by JPL's Deep Space Network and Advanced MultiMission Operations System. Analogous to the services paradigm of a telephone company, a standard service model derived from 8 key attributes has led to a service architecture characterized by simple interfaces between mission specific elements and their underlying services, full performance and cost accountability, and operations automation for service production.

***Demand Access Automata* is the infusion of a suite of technologies that break today's contact conundrum, the cost driving requirement for nearly continuous contact with each and every craft we fly. The components of contact have been analyzed and simultaneously addressed; we identify a spacecraft generated' beacon' to initiate contact only when necessary, a 'virtual emergency room' to automatically orchestrate ground response, and a' high efficiency tracking' scheme to optimize use of expensive resources.**

Future small missions will be characterized by geographically distributed flight teams of 10 or less scientists and engineers. *Distributed Science Hubs* provide a trio of information system capabilities to these experts, consisting of individual access to all traditional mission functions and services, powerful multimedia intrateam communications to facilitate collaborative investigation, and automated direct transparent communication between scientist and instrument.

JPL is currently developing this architecture, has undertaken prototyping tasks to instantiate its elements, and making plans for flight demonstration.